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(54) Transmission gear shift and control device, particularly for industrial vehicles.

(57) A device is described for the selection and control of gears in a vehicle gearbox of the type in which a lever (2) which can be operated by the driver is able to act, via a link (15) on gear selector forks (6, 7). The link (15) has a shaft (3) carrying a first sector (4) and a second sector (5) conveniently spaced along the axis of the shaft (3) and operable to cooperate respectively with a first fork (6) and a second fork (7), in such a way as to displace these latter simultaneously one in one direction (E) and the other in the opposite direction (F) upon rotation of the said shaft (3) in a first direction (C), and vice versa.

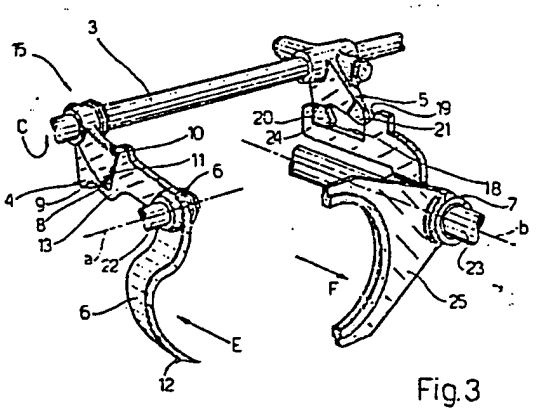

Fig.3

EP 0 149 020 A2

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"Transmission gear shift and control device, particularly for industrial vehicles"

The present invention relates to a device for the selection and control of the gears of a gearbox, in particular for industrial vehicles.

Numerous selection and control devices for gearboxes are known. Such devices essentially have a lever which can be actuated by the driver to control the movement of forks by which the engagement of the desired gears is effected. A simplified diagram of a device of known type for the selection and control of gears is illustrated in Figure 1 of the attached drawings. The gears are indicated with the letters A and B; in particular it is to be noticed that for engagement of the gear A the following three selection movements are necessary: OP, PP', P'P". Moreover, in order to obtain a precise positioning of the selection lever before engaging the gear there must be provided two spring locks at the points P and P'. It is therefore not possible simultaneously to disengage both gears A and B, for each of which it is then necessary to provide a supplementary security lock to maintain one gear out of engagement when the other gear is engaged. Finally, in such devices, the changing of gears involves first of all the complete disengagement of the currently engaged gear and subsequently the engagement of the other gear; a supplementary selection path is therefore required, in which neither of the two said gears is engaged.

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The object of the present invention is that of providing a selection and control device for the gears of a motor

vehicle gearbox, by means of which the gears can be engaged in a reliable manner with simple means and a short engagement movement.

The said object is achieved with the present invention in that it relates to a device for the selection and control of the gears in a motor vehicle gearbox, of the type in which a lever, operable by the driver, is able to act, via a link, on the gear selector forks, characterised by the fact that the said link includes a rod carrying a first sector and a second sector conveniently spaced along the axis of the rod itself and able to cooperate respectively with a first fork and a second fork in such a way as to displace these latter simultaneously one in one direction and the other in the opposite direction, upon rotation of the said rod in a first direction and vice versa.

For a better understanding of the present invention there is hereinafter described a preferred embodiment, purely by way of non limitative example, and with reference to the attached drawings, in which:

Figure 1 is, as already mentioned, a gear selection and engagement diagram of a device of known type;

Figure 2 is a gear selection and engagement diagram of a device formed according to the present invention;

Figure 3 is a perspective view of the device of Figure 2; and

Figures 4, 5 and 6 are schematic views on an enlarged scale, of the device of Figure 3 in different operating phases.

With reference to Figure 2, the innovative principle of operation adopted for the selection and engagement of two gears indicated A and B disposed in line and which can be engaged one in opposition to the other is illustrated in a schematic manner. From this diagram it will be evident that the stroke P'P" (see Figure 1) for engagement of the gear B is no longer required.

The alternative engagement of a gear with simultaneous disengagement of the other gear is achieved with a device 1 the essential parts of which are illustrated in Figure 3. This device includes, essentially, a lever 2 the purpose of which is to actuate, by means of a control link 15, forks 6 or 7 operable to engage respectively the gears A or B.

The control link includes a control rod 3 coupled to the lever 2; this rod carries two control sectors 4 and 5 suibably spaced from one another. Both the control sectors 4 and 5 are fixed to the control rod 3 and cannot turn about it.

The sectors 4 and 5 each include two control noses 10, 11 and 20, 21 respectively. The control noses 10, 11 of the sector 4 are formed in such a way that they are constituted as part of a single integrated shaped component; the control noses 20, 21 of the sector 5 are two noses separated from one another in such a way that, viewed in the direction of the axis of the control rod 3 (Figure 4) they are angularly offset and separated one from the other and both have an acute angle. With particular reference to Figure 4, the noses of the sectors 4 and 5

engage in cavities 8, 18 and the inclined ramp surfaces 9, 19 of the forks 6 and 7 in a manner which will be illustrated in more detail below.

By examining in detail the forks 6 and 7 it can be observed that the first is essentially shaped as a two-arm lever mounted rotatably about a shaft 22 (axis a), having a C-shape end portion 13 engaging with the sector 4 and an opposite end portion 12 which can couple, in a manner not illustrated, with the said gear A to engage or disengage this latter. The fork 7 is axially slidably mounted with respect to a shaft 23 (axis b) and has a first, essentially C-shape, end portion 24 meshing with the sector 5, and an opposite end portion 25, also of C-shape, extending radially with respect to the shaft (23). This fork 7 can couple, in a manner not illustrated, with the said gear B to engage or disengage this latter.

The operation of the device 1 is as follows. With particular reference to Figure 3, it can be seen first of all that a rotation of the shaft 3 in an anti-clockwise direction (arrow C) due to the actuation of the lever 2 causes the forks 6 and 7 respectively to perform a rotation of the end 12 about the axis a in the direction indicated by the arrow E and a translation of the end 25 along the axis b in the direction indicated by the arrow F. Rotation and translation takes place in the opposite senses from those indicated by the arrows E and F if the shaft 3 is turned in a clockwise sense (arrow D).

The movements which can take place are essentially as follows:

a) selection (Figure 4);

b) engagement of gear A and disengagement of gear B (Figure 6);

c) engagement of gear B and disengagement of gear A (Figure 5).

In the selection phase (see Figures 3 and 4) the shaft 3 slides along its axis until the sectors 4 and 5 engage the cavities 8, 18 of the respective forks 6, 7.

The engagement of gear A (see Figures 3 and 6) takes place by the effect of the rotation of the shaft 3 in an anti-clockwise sense (arrow C). Such rotation is transmitted to the end 13 of the fork 6 by means of the nose 10 of the sector 4 such that the end 12 displaces in the direction indicated by the arrow E causing engagement of the gear A. Correspondingly the nose 21 of the sector 5 prevents the fork 7 from also moving in the direction of the arrow E, maintaining this fork in the positionof disengagement of the gear B. The engagement of the gear B (see Figures 3 and 5) takes place by the effect of the rotation of the shaft 3 in a clockwise sense (arrow D). The rotation movement is transmitted to the end 24 of the fork 7 by the nose 20 of the sector 5 so that the end 25 of this latter displaces in the direction indicated by the arrow E causing engagement of the gear B. In the meantime the nose 11 of the sector 4 has carried the fork 6 first into the neutral position (Figure 4) and then prevents the rotation of it by acting on the ramp surface 9. The selection of other gears (gears other than the gears A and B mentioned above) can take place by simply translating the shaft 3

along its axis in such a way as to make the sectors 4 and 5 engage in corresponding cavities of other forks. From a study of the characteristics of the device formed according to the present invention the advantages which it allows are evident. First of all it permits the gear A or else the gear B to be engaged without having to take particular precautions (spring locks, safety locks etc.,). Moreover, it does not allow erroneous manoeuvres to be effected, nor does it require the levers 2 to have supplementary paths by the simple fact that the first half of a movement serves for the disengagement of the engaged gear and the unlocking of the other gear, whilst the second half of the movement causes locking of the previously engaged gear and engagement of the other gear.

Finally, it is clear that the device 1 described above can have modifications and variations introduced thereto without departing from the scope of the present invention.

CLAIMS

1. A device for the selection and control of gears in a vehicle gearbox of the type in which a lever, actuated by the driver, is operable to act, via a link, on gear selection forks, characterised by the fact that the said link (15) includes a shaft (3) carrying a first sector (4) and a second sector (5) conveniently separated along the axis of the shaft (3) itself and operable to cooperate respectively with a first fork (6) and a second fork (7), in such a way as to displace these latter simultaneously one in one direction (E) and the other in the opposite direction (F) upon rotation of the said shaft (3) in a first direction (C), and vice versa.

2. A device according to Claim 1, characterised by the fact that the said first fork (6) is essentially formed as a two-arm lever (12, 13) rotatable about an axis of rotation (a) parallel to a longitudinal axis of the said shaft (3); one end of a first arm (13) of the said first fork (6) cooperating with the said first sector (4), and one end of a second arm (12) of the said first fork (6) constituting an operating end for engagement of a first gear (A).

3. A device according to Claim 1 or Claim 2, characterised by the fact that the said second fork (7) is essentially formed as a sliding sleeve with two arms (24,25), a translation axis (b) of which is located perpendicular to a longitudinal axis of the said shaft (3); one end of a first arm (24) of the said second fork (7).

cooperating with the said second sector (5), and one end of a second arm (12) of the said second fork (7) constituting an operating end for engagement of a second gear (B).

4. A device according to Claim 2 or Claim 3, characterised by the fact that each said control sector (4,5) includes two respective noses (10,11 and 20,21), a first nose of which is operable to engage a cavity (8, 18) of the associated fork (6,7) and a second nose (11, 21) is operable to cooperate with a respective ramp (9, 19) of the associated fork (6,7) in such a way as to prevent engagement of the said second gear (B) by the said second fork (7) when the said first gear (A) is already engaged by the said first fork (6), and vice versa.

5. A device according to Claim 4, characterised by the fact that the said cavity (8,18) and ramp (9,19) are formed in respective ends of the said first arms (13, 24) of the said first and second fork (6,7).

6. A device according to Claim 4 or Claim 5, characterised by the fact that each said control nose (10,11 and 20,21) constitutes an integral part of the respective said first and second sectors (4,5).

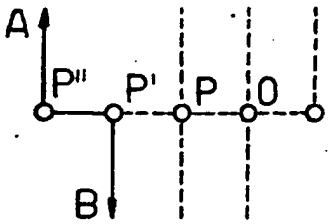

Fig.1

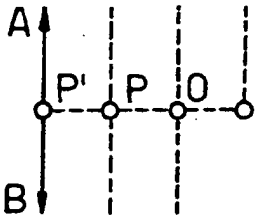

Fig.2

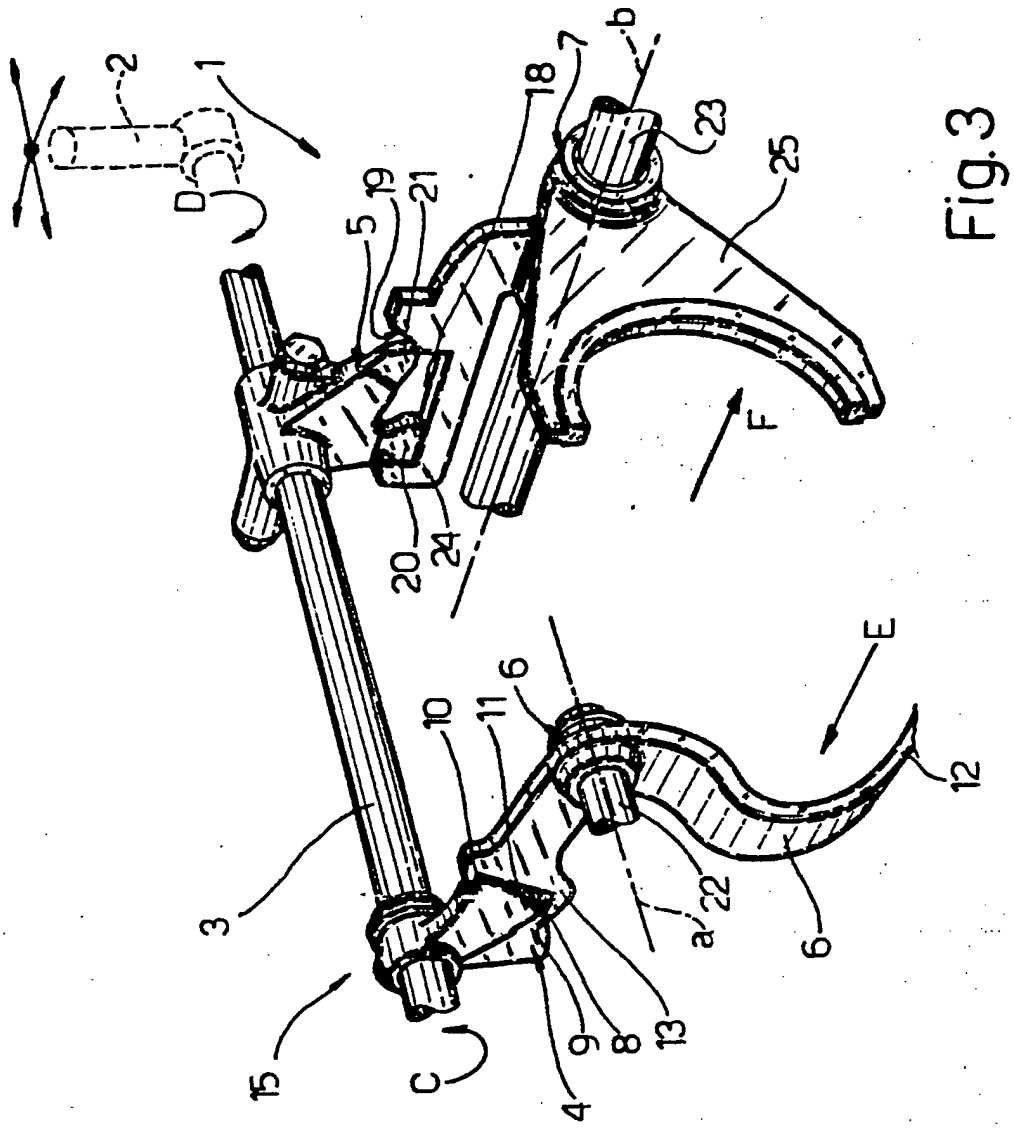

Fig.3

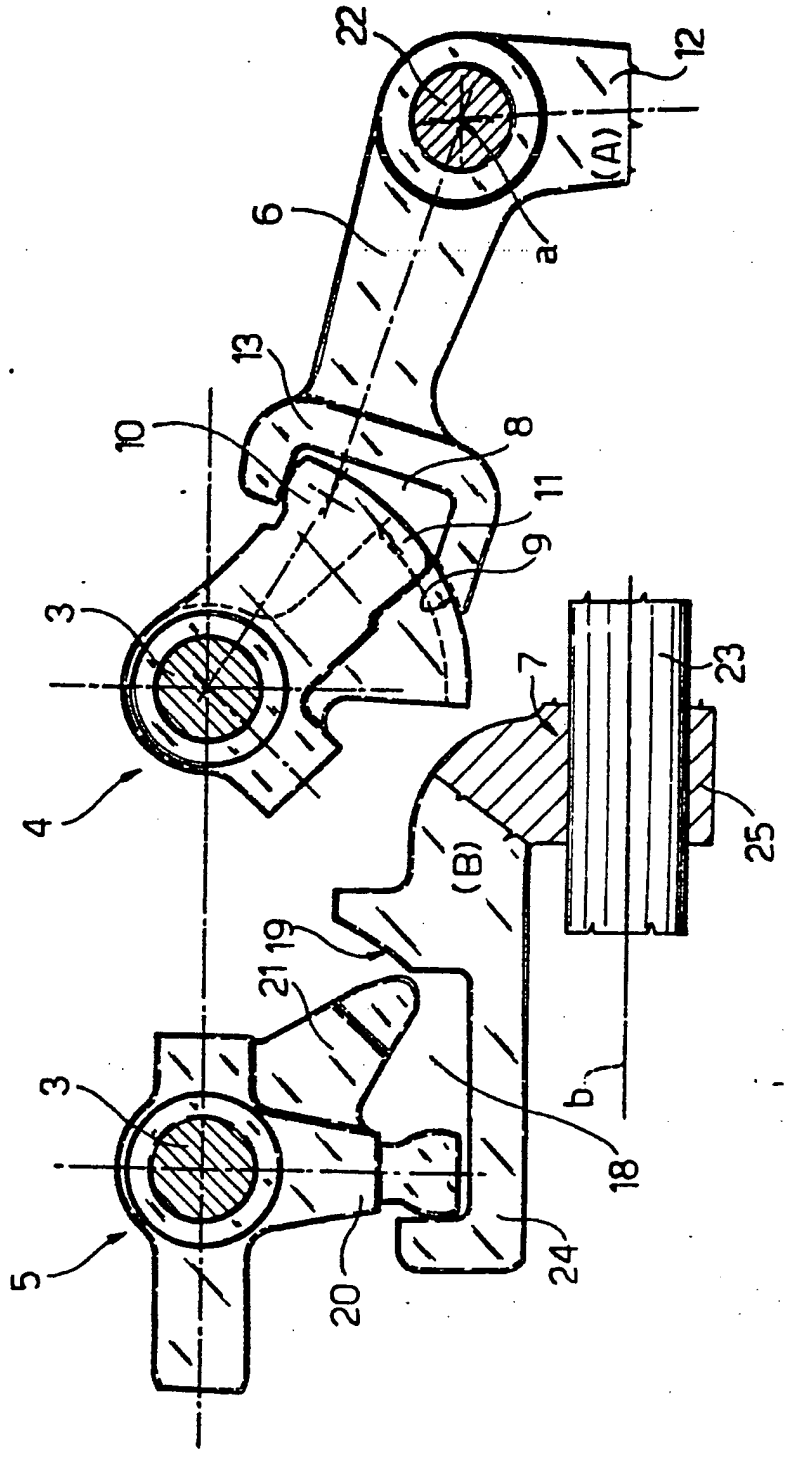

Fig. 4

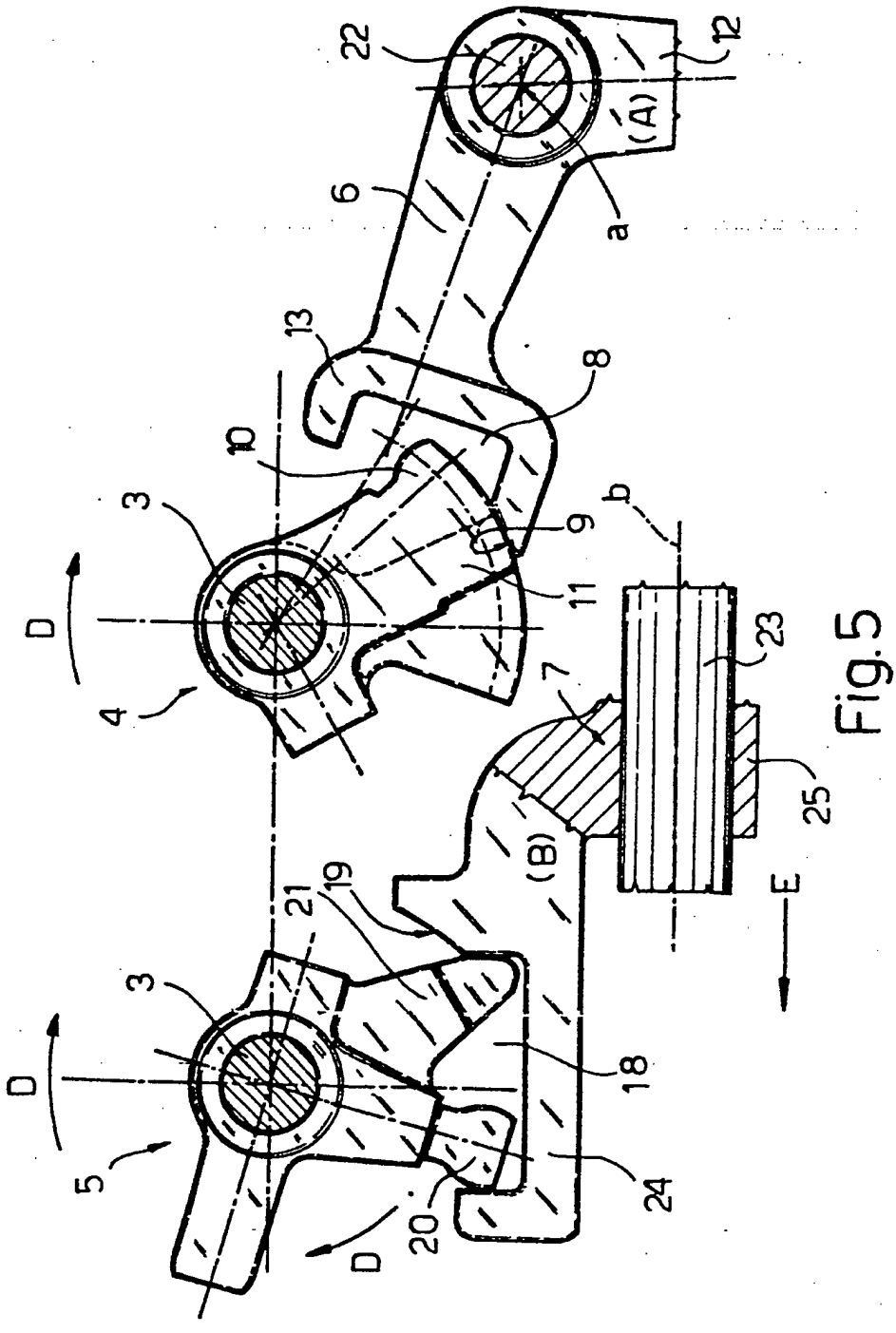

Fig.5

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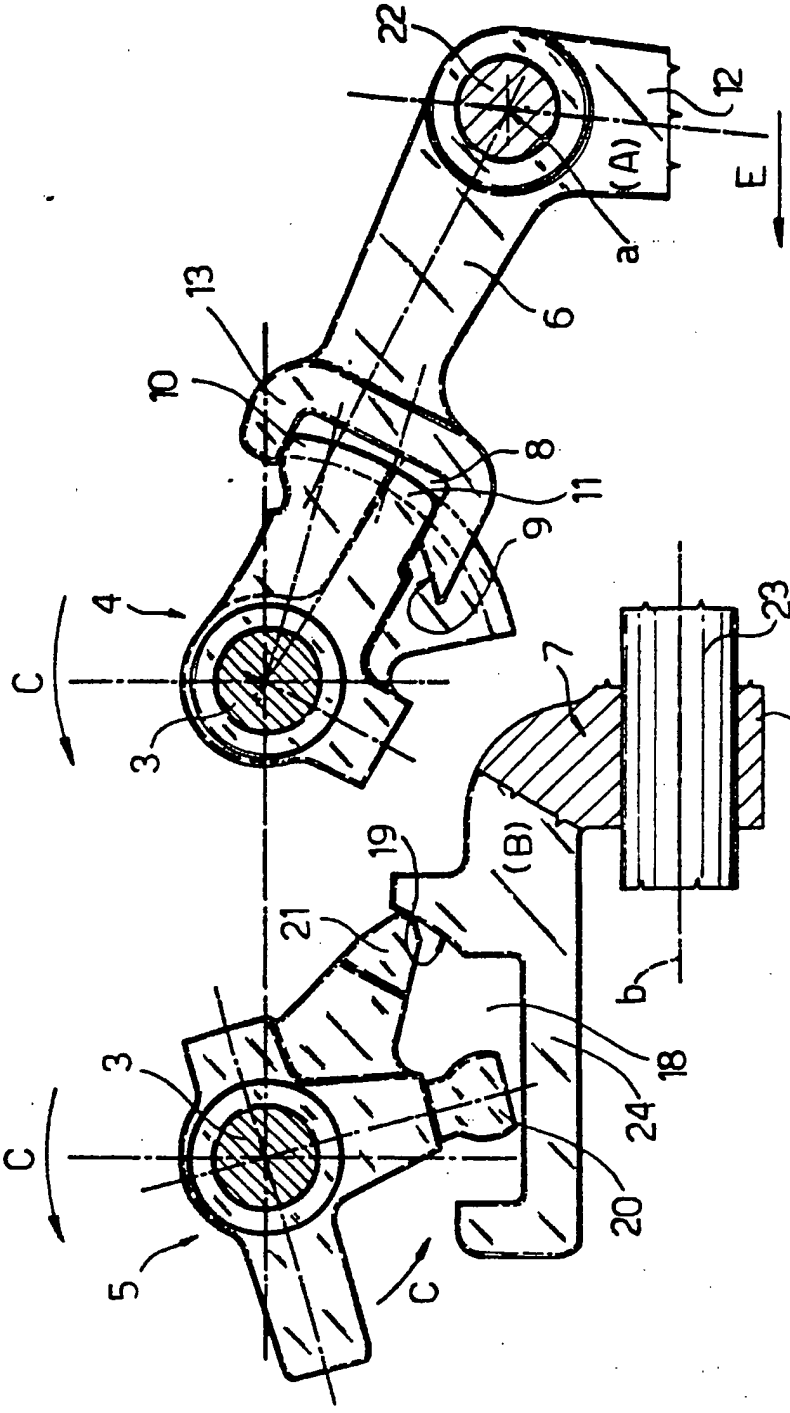

Fig.6